

REDUCING SEDIMENT LOADING TO NEWPORT BAY:

25 Years of Planning, Implementation and Monitoring

Jamie Habben, County of Orange
NPS Conference, May 2008

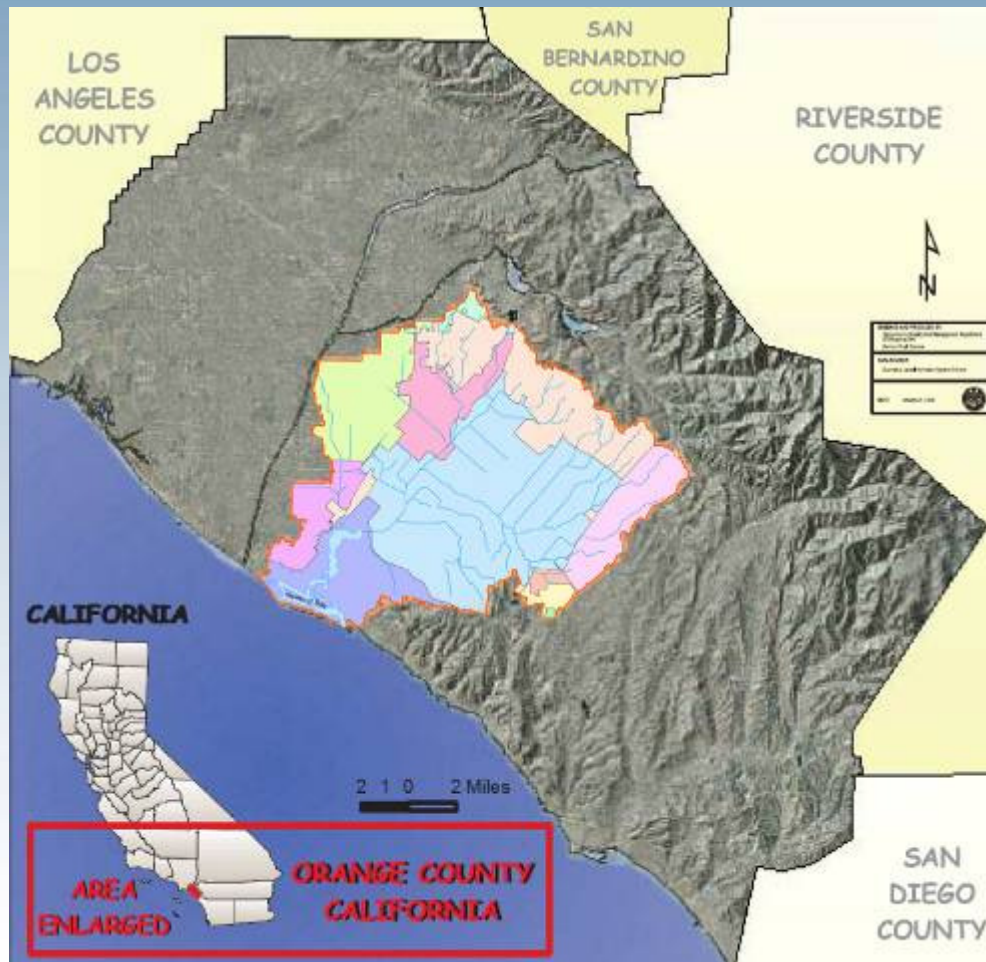


Presentation Outline



- Background on the San Diego Creek/Newport Bay Watershed
- History of the Sedimentation Problem
- Early Efforts of the 208 Sediment Control Plan
- Sediment TMDL Program
- Monitoring Results
- Summary

San Diego Creek/ Newport Bay Watershed



- Located within Orange County, CA
 - *11 cities + County*
- 154 total square miles
 - *118 square miles – SDC watershed*
- Three main geographical areas
- Watershed drains into Newport Bay

Newport Bay



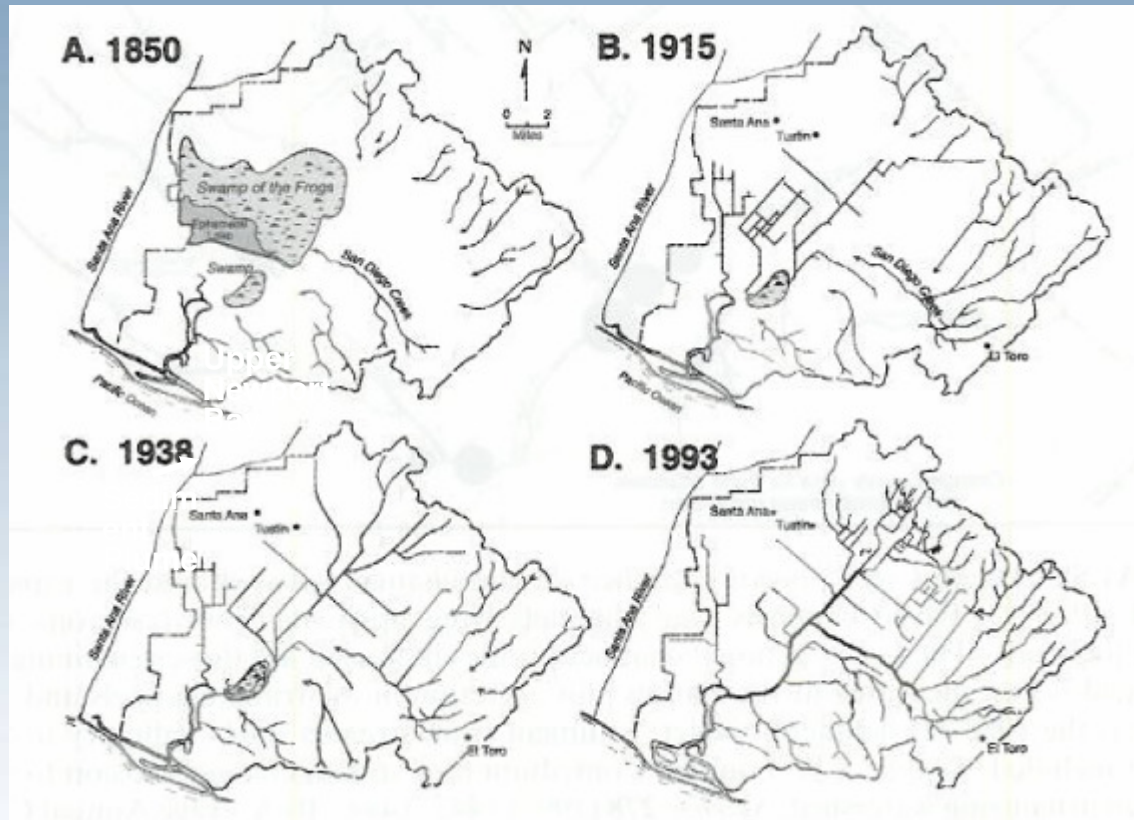
- **Upper Newport Bay**
 - State Ecological Reserve
 - Habitat for 200+ species of birds, including endangered light-footed clapper rail & CA least tern
- **Lower Newport Bay**
 - Fully developed and channeled harbor
 - One of largest small craft pleasure harbors in the United States

Newport Bay and Watershed



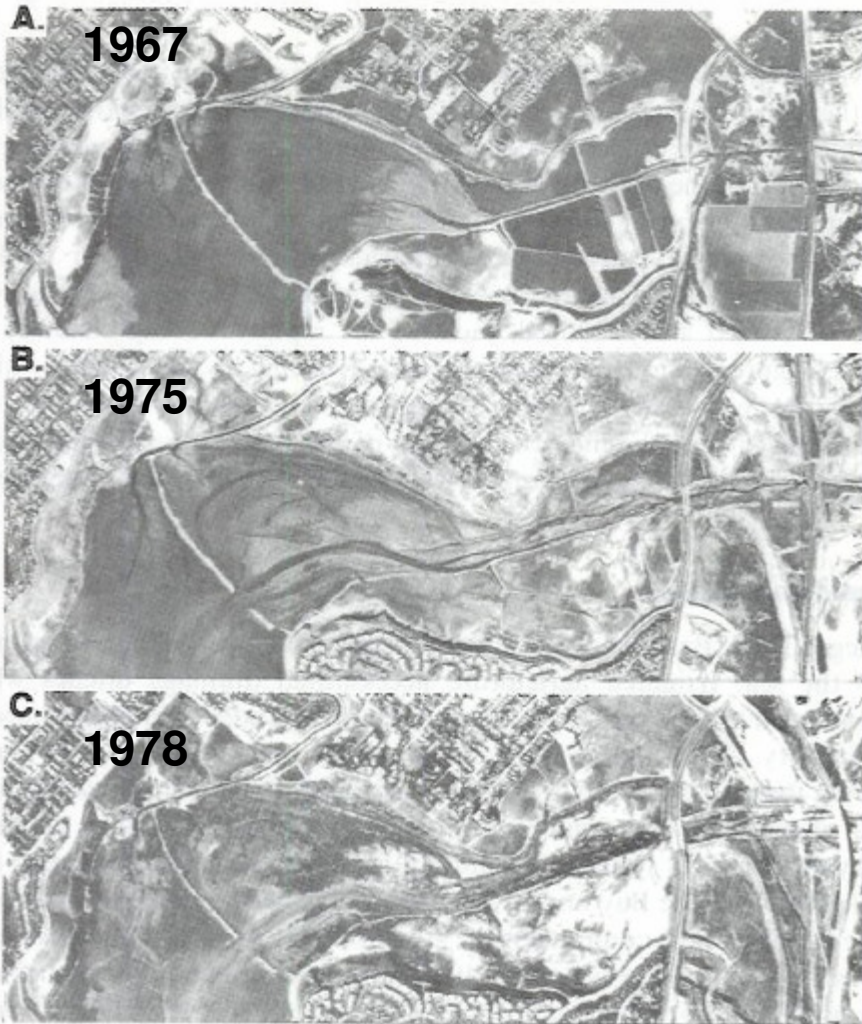
- Area has experienced dramatic change in land use since 1900
- Agriculture predominant use historically
 - 1983 - 22%
 - 2002 - 5%
- Rapidly urbanizing
 - 1983 - 47% urban
 - 2002 - 75% urban

History of Sedimentation Problem



- Changes in land use of area
- Ditch drainages artificially channeled into Upper Newport Bay

History of Sedimentation Problem



- San Diego Creek channeled to UNB in 1965
- Major Floods in 1969 and 1978
- Large amounts of sediment deposited in Upper Newport Bay
- Ecological Reserve adversely affected

History of Sedimentation Problem



Early Efforts – CWA Section 208 Plan



- Local agencies sponsored intensive study to address excess sediment in Newport Bay
- San Diego Creek Comprehensive Stormwater Sedimentation Control Plan completed in 1983
- Study indicated that bulk of sediment coming from surrounding hills, agriculture, and construction
- Executive Committee formed to continue to implement recommendations of the Plan

NEWPORT BAY WATERSHED

SAN DIEGO CREEK COMPREHENSIVE
STORMWATER SEDIMENTATION CONTROL PLAN

ORANGE COUNTY
CALIFORNIA



PREPARED FOR THE
CITIES OF IRVINE AND NEWPORT BEACH
AND THE
SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS

AUGUST 1983

B Boyle Engineering Corporation
consulting engineers / architects



Early Efforts – 208 Plan

Consisted of land management practices to reduce sediment at its sources, and structural measures to localize sediment deposition and facilitate its management

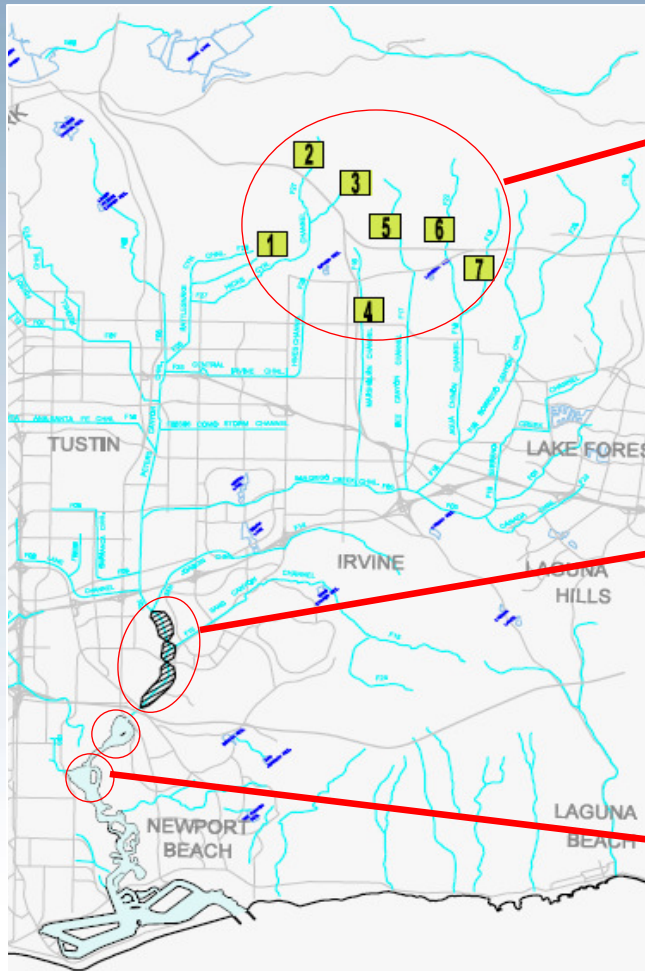
- Agricultural BMPs
- Construction BMPs
- Installation of in-channel basins
- Installation of in-Bay basins
- Stabilization of channels w/in developing areas
- Installation of foothill basins
- Sediment Monitoring

Early Efforts – SDC Flood Control Master Plan



- Developed in mid 1980s
- Provides the hydrology, channel alignment and retarding characteristics for backbone improvements through 2020
- Provide a basis for drainage requirements for future projects (e.g. I-5 widening, land development etc.)
- Sediment management strategies included to assist in implementing the 208 Plan
- RESULTED in an integrated watershed planning effort

Early Efforts – 208 Plan Construction of Sediment Basins



Foothill Basins

In-channel
Basins



San Diego Creek In-channel basin 2
outlet structure - looking upstream

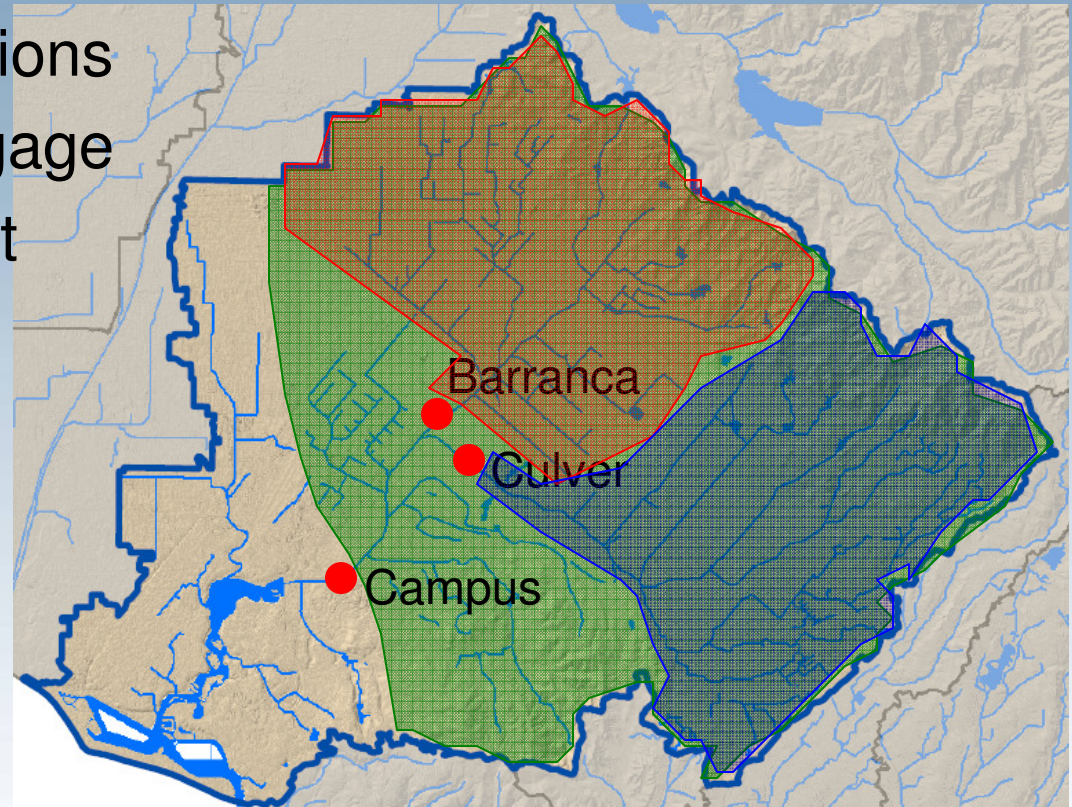


In-bay Basins

Early Efforts – 208 Plan Sediment Monitoring



- 3 representative stations
- Continuous stream gage
- Suspended sediment
- Scour studies



Additional Monitoring Efforts – Channel Erosion Studies



- Channel erosion studies initiated in 1982 by Stanley W. Trimble, UCLA Dept. of Geography
- In 1983, just under 200 cross-sections installed across earthen channels of all sizes and types and surveyed
- Surveyed annually – new profiles added/subtracted
- By 1993, results showed that channel erosion furnished more than 50% of sediment yield from San Diego Creek



Regulatory Background



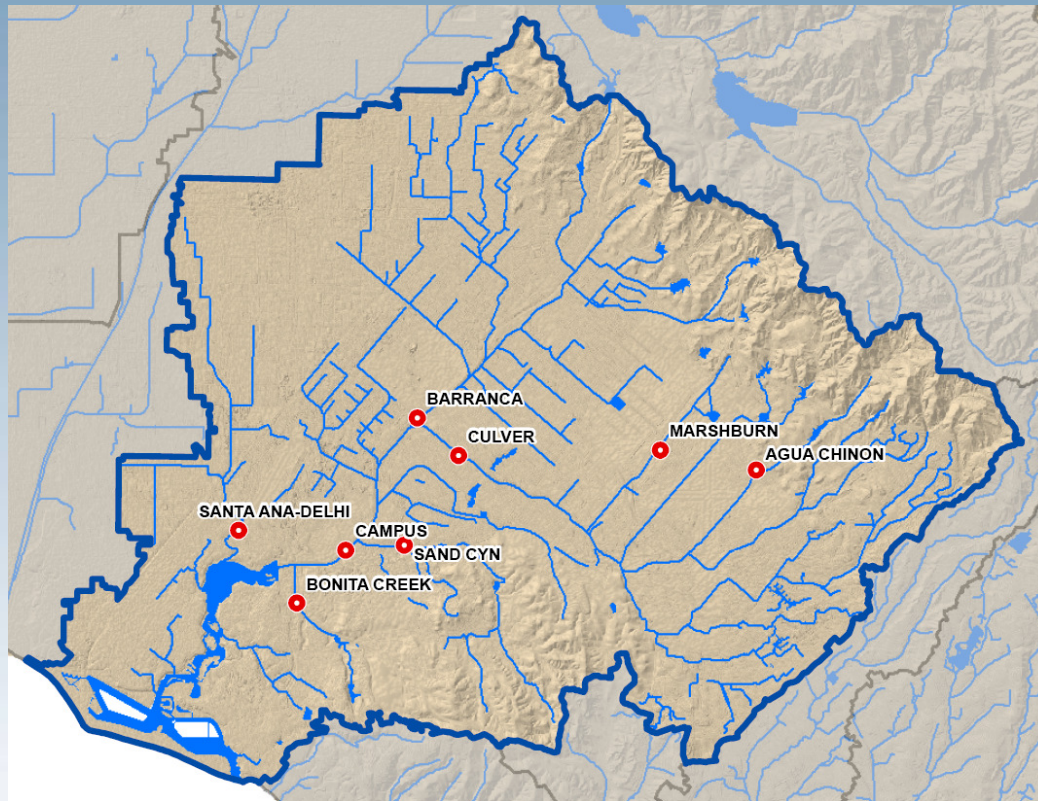
- Newport Bay placed on 1996 303(d) list HIGH priority for TMDL development
- Consent decree entered into October 31, 1997 between USEPA and Defend the Bay
- EPA promulgated TMDL on April 13, 1998
- March 1999 – State of CA ratified the Sediment TMDL
- April 1999 – Sediment TMDL cost-share implementation Agreement b/w 4 cities, County, The Irvine Company

Sediment TMDL Targets



- 50% reduction in sediment load to Newport Bay within 10 years (2009)
- No greater than 1% change in Bay habitat acreages due to sediment deposition
- Depth requirements (-7 ft MSL) in UNB basins
- Reduced frequency of dredging in UNB

Watershed Monitoring



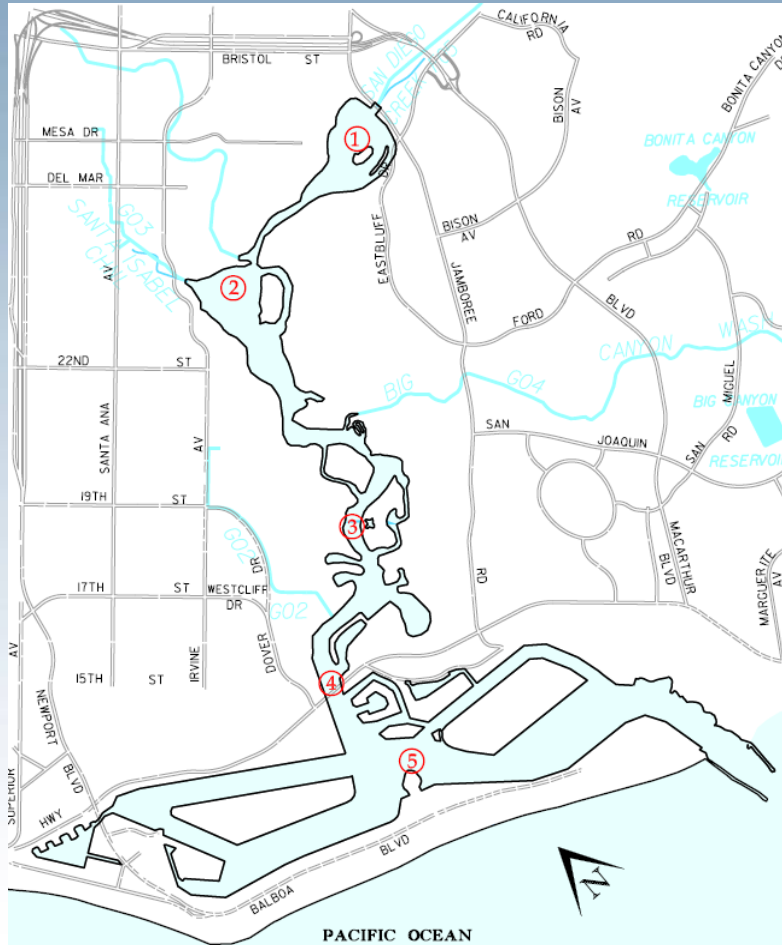
- 8 streamgaging/sediment monitoring stations
- Based on land-use
 - Open space
 - Agriculture
 - Construction
 - Urban
 - Mixed



Fluvial Sediment Monitoring



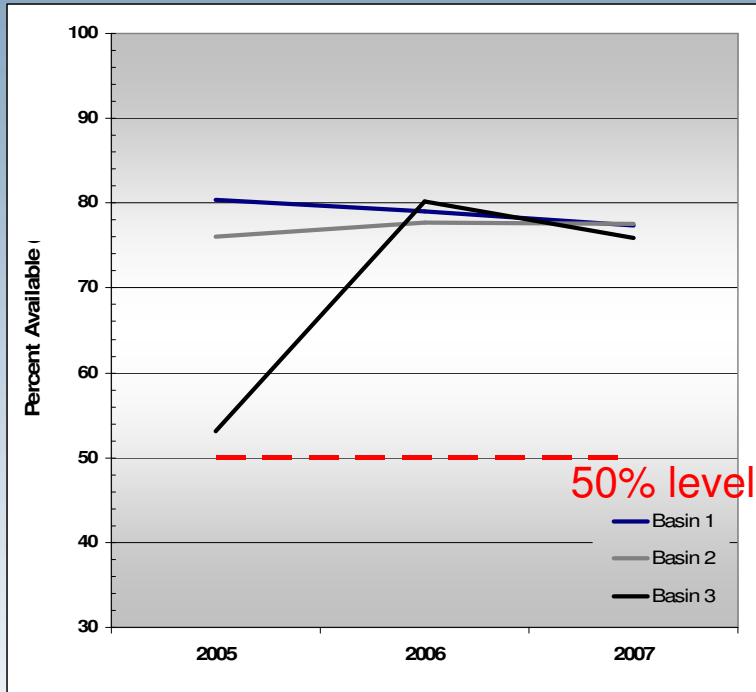
Bay Monitoring



- Topographic/Bathymetric and Vegetative Monitoring
 - Every 3 years
- Sediment sampling



Scour Studies

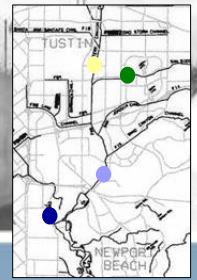


In-channel Basin Capacities: 2005-2007

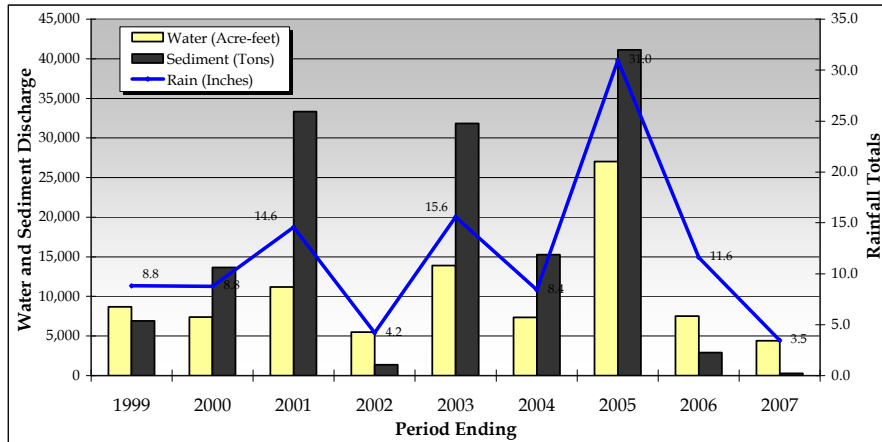
Percent Available

- In-channel Basins
 - Annually
- Foothill Basins
 - Every 5 years
 - Yrs w/ 100% mean basin rainfall (~13")
- SDC Reach 1 and 2
 - Every 5 years
 - Yrs w/ 150% mean basin rainfall (~19.5")

Annual Sediment and Streamflow Discharges, 1999-2007

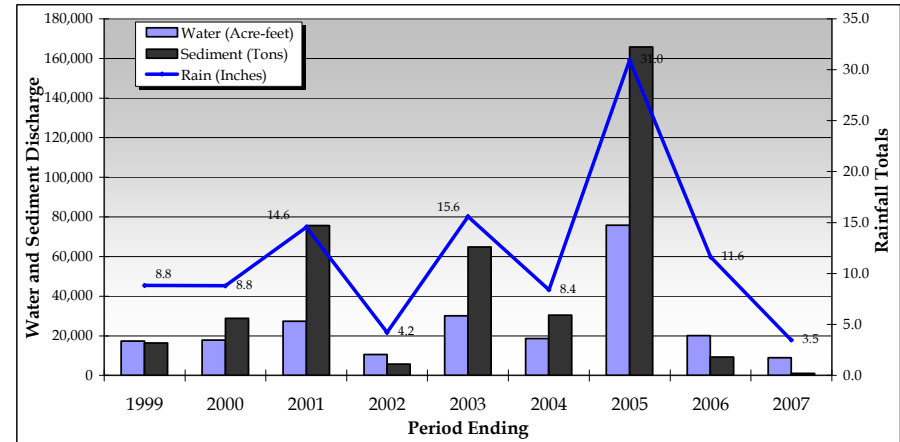


Peters Canyon Wash at Barranca Parkway, 1999-2007

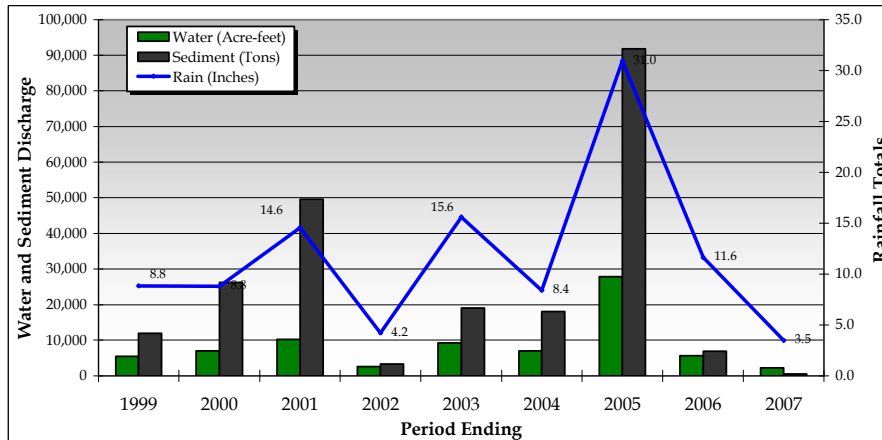


Annual Totals for 2007 are estimates.

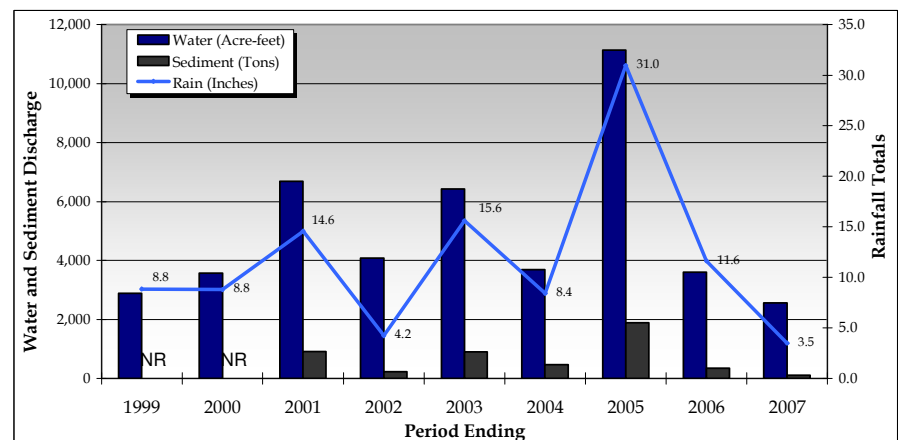
San Diego Creek at Campus Drive, 1999-2007



San Diego Creek at Culver Drive, 1999-2007

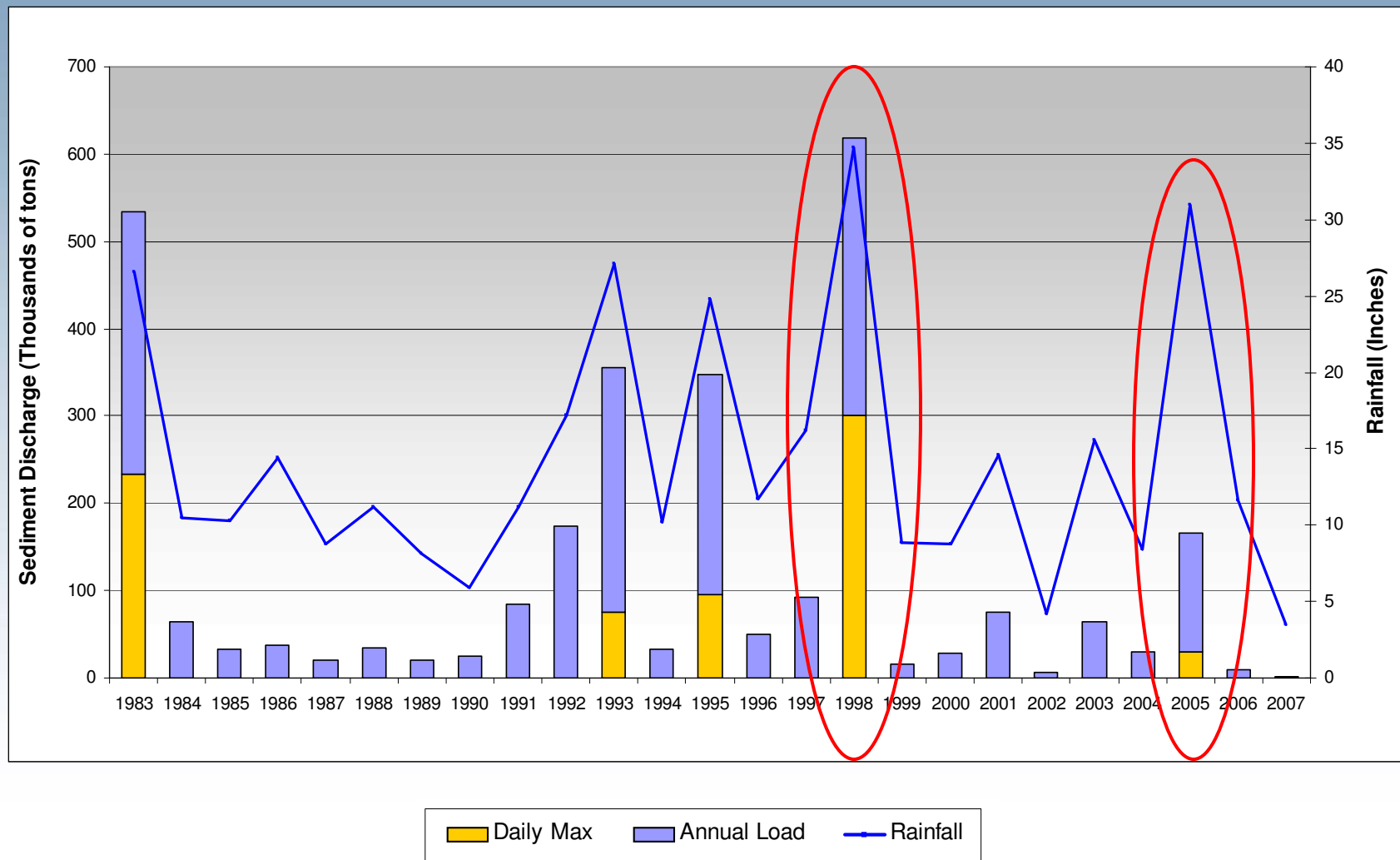
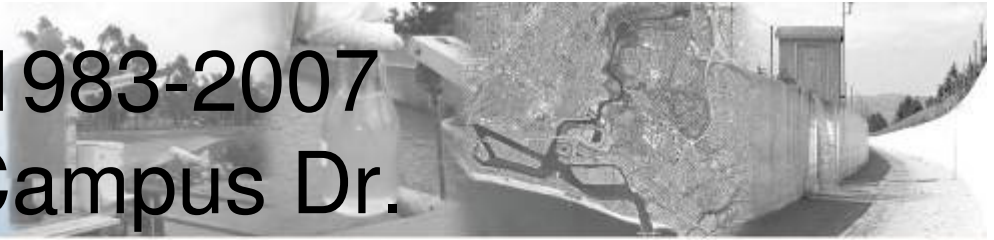


Santa Ana Delhi at Irvine Avenue, 1999-2007



Sediment Discharge 1983-2007

San Diego Creek at Campus Dr.



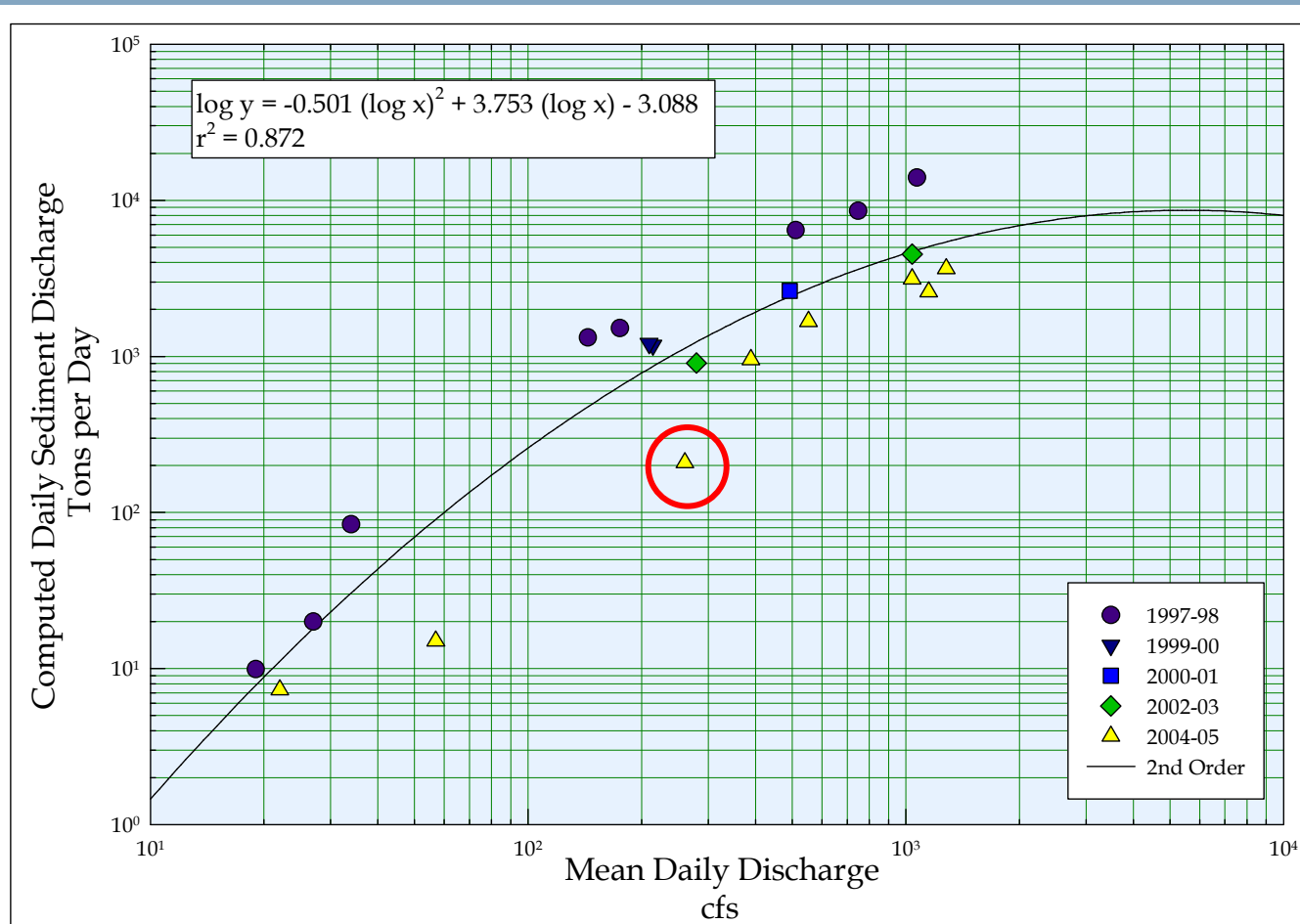
Monitoring Results 1983-2005



Year	Annual Flow in acre-feet			Annual Sediment Discharge in tons		
	San Diego Creek at Campus Drive	Peters Canyon at Barranca Parkway	San Diego Creek at Culver Drive	San Diego Creek at Campus Drive	Peters Canyon at Barranca Parkway	San Diego Creek at Culver Drive
1983	58,952	24,323	16,504	534,035	178,507	158,651
1984	29,425	15,774	5,657	64,455	26,897	24,599
1985	26,987	11,831	5,879	32,236	18,331	27,904
1986	29,746	12,453	6,654	37,760	NR	NR
1987	21,423	12,112	NR	20,060	9,800	NR
1988	22,089	10,797	3,751	34,186	21,037	12,408
1989	17,359	10,489	3,666	19,810	16,264	13,163
1990	19,154	NR	NR	24,855	NR	NR
1991	28,935	NR	NR	83,924	NR	NR
1992	37,186	14,697	11,676	173,212	47,845	103,516
1993	62,510	29,170	22,140	355,208	116,283	228,309
1994	20,000	9,910	4,190	33,027	15,075	12,705
1995	61,182	19,493	NR	347,579	82,633	NR
1996	23,501	8,453	6,323	49,438	8,716	32,064
1997	33,946	13,392	10,240	92,181	30,529	68,266
1998	92,345	34,072	35,555	611,461	179,579	404,085
1999	17,334	8,703	5,499	16,439	6,908	11,957
2000	17,780	7,400	6,960	28,864	13,639	26,205
2001	27,320	11,180	10,280	75,686	33,301	49,592
2002	10,610	5,520	2,630	5,640	1,392	3,354
2003	30,090	13,910	9,230	64,740	31,835	19,039
2004	18,690	7,380	7,020	30,464	15,265	18,065
2005	75,860	27,040	27,790	165,810	41,108	91,862
1983-99 average	35,416	15,711	10,595	148,816	54,172	91,469
2000-05 average	30,058	12,072	10,652	61,867	22,757	34,686
ratio of 2000-05 average to 1983-99 average	84.9%	76.8%	100.5%	41.6%	42.0%	37.9%
ratio of 2005 value to 1983-99 average	2.14	1.72	2.62	1.11	0.76	1.00

- 2005 period had normal runoff at all long term monitoring stations (1.7-2.6)
- 2005 Sediment load less than what would be expected (0.7-1.1)
- TMDL annual flows comparable to pre-TMDL flows
- TMDL sediment loads less than half pre-TMDL loading

Sediment Transport Curve, '98 - '05 Peters Canyon Wash at Barranca



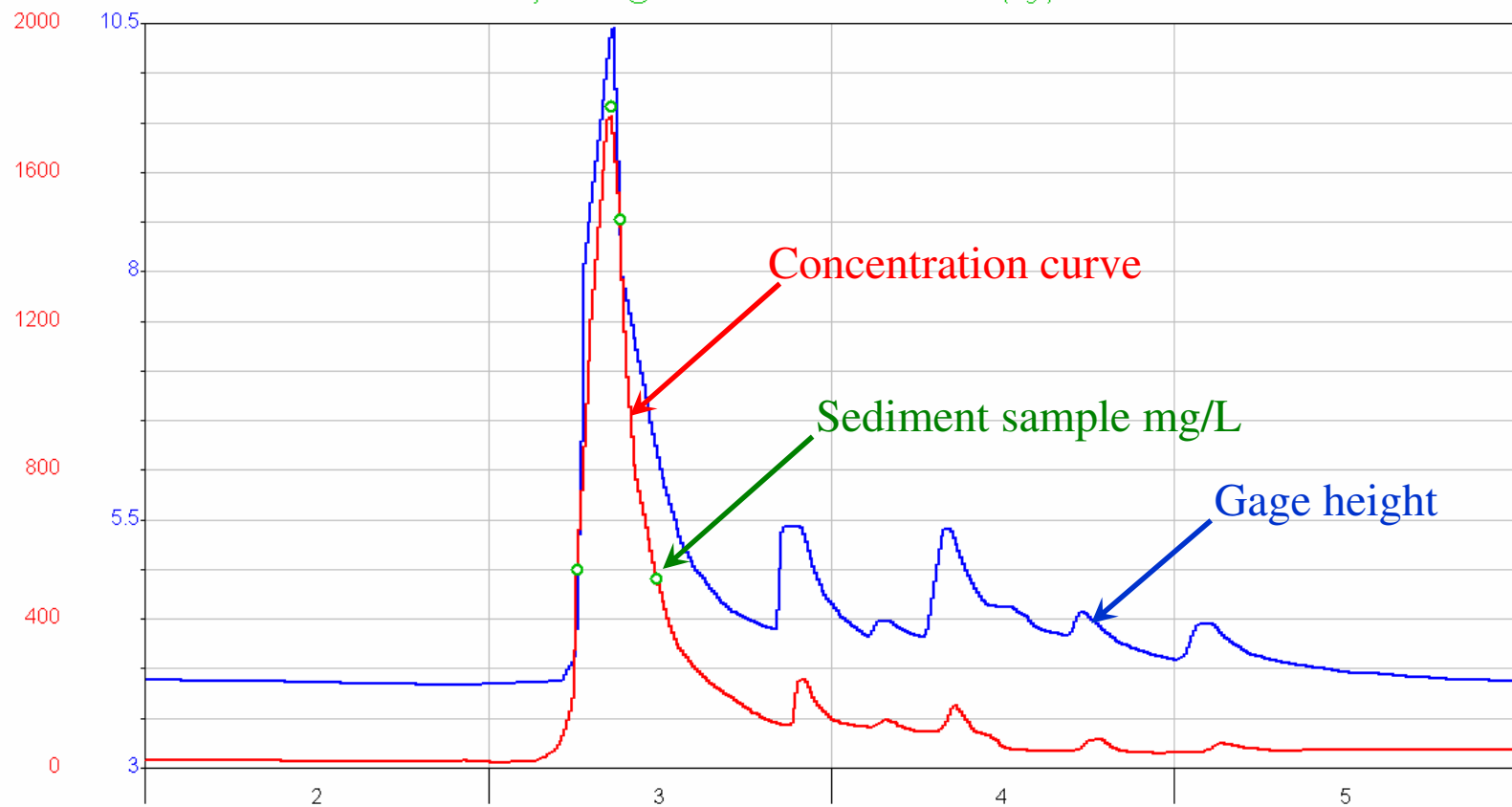


Period 4 Day Plot Start 00:00_01/02/2005

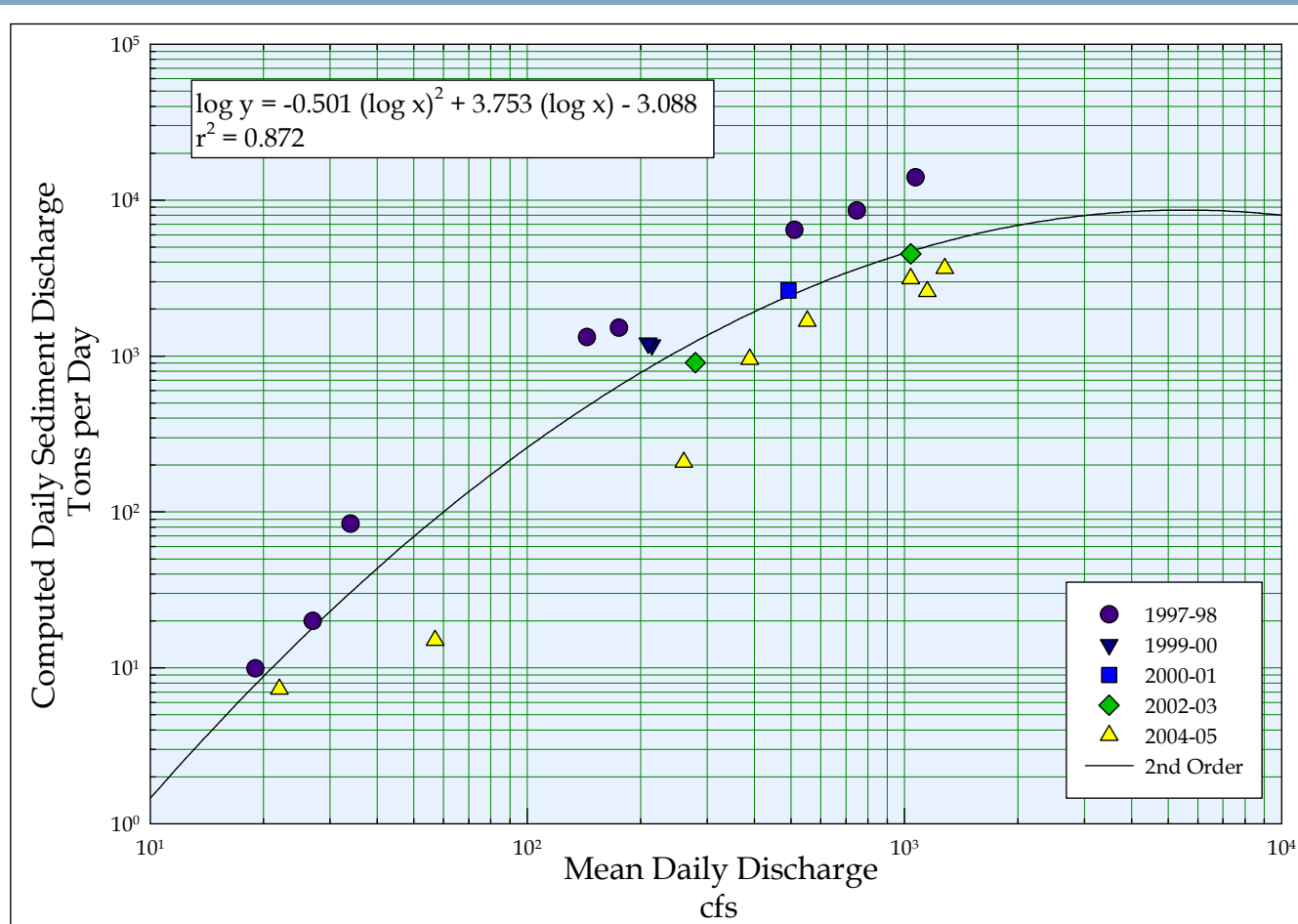
2005

Interval 10 Minute Plot End 00:00_01/06/2005

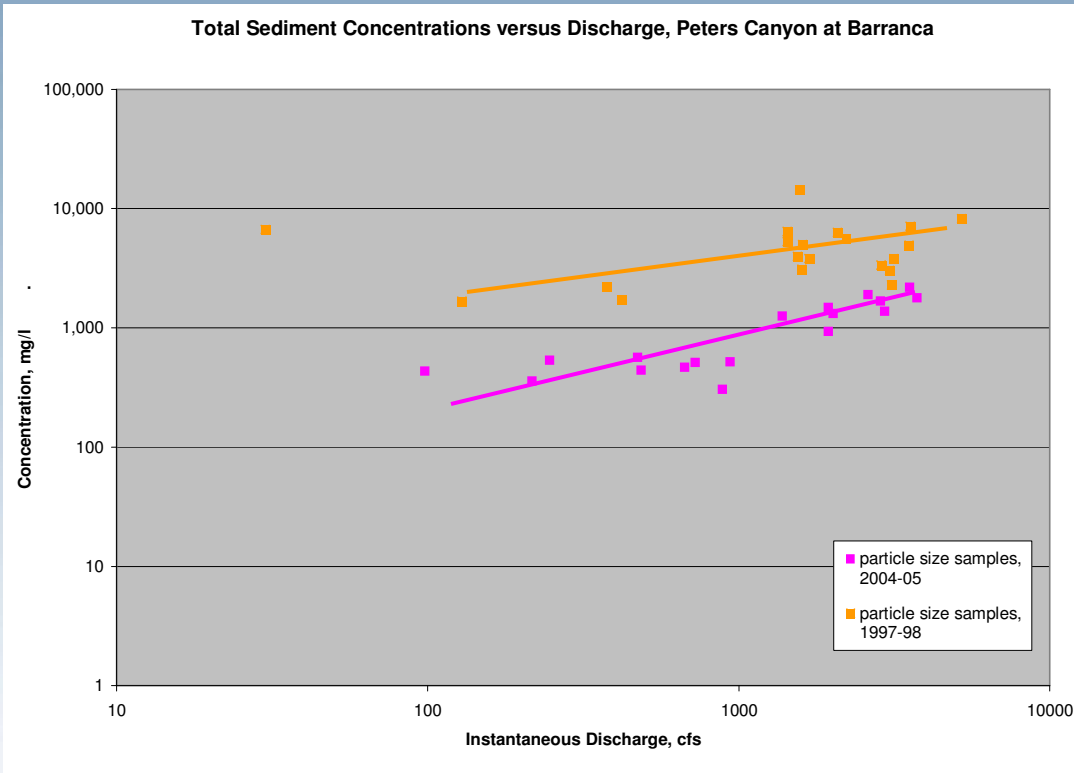
— PETERS	Peters Canyon Wash @	232.00	Mean	Raw Level (ft)
— PETERS	Peters Canyon Wash @	851.00	Mean	Sediment (mg/l)
○ PETERS	Peters Canyon Wash @	851.05	Point	Sediment (mg/l)



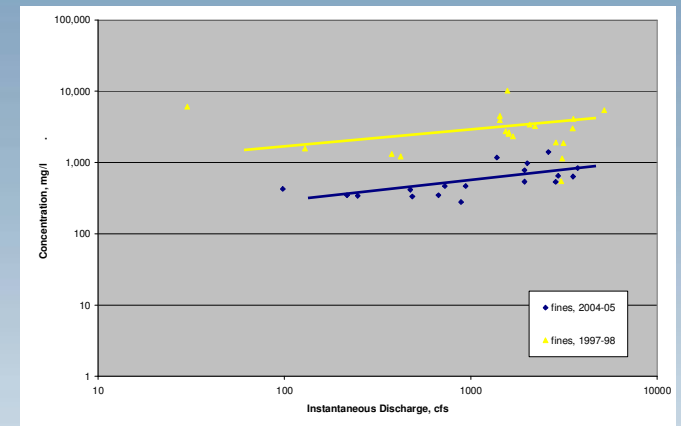
Sediment Transport Curve, '98 - '05 Peters Canyon Wash at Barranca



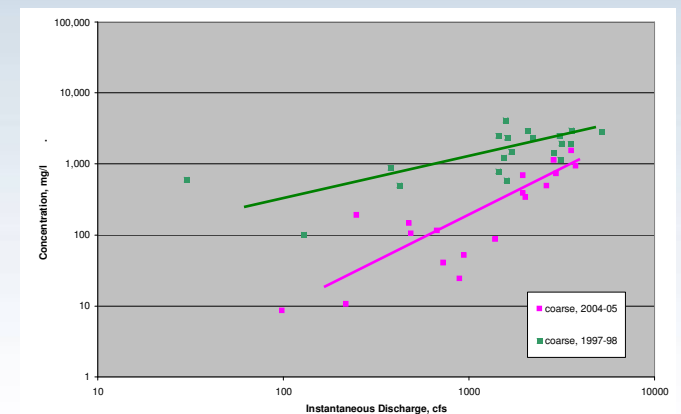
Sediment Conc. Data, '98 vs '05 Peters Canyon Wash at Barranca



Total sed conc. (mg/L) vs. Inst. discharge (cfs)



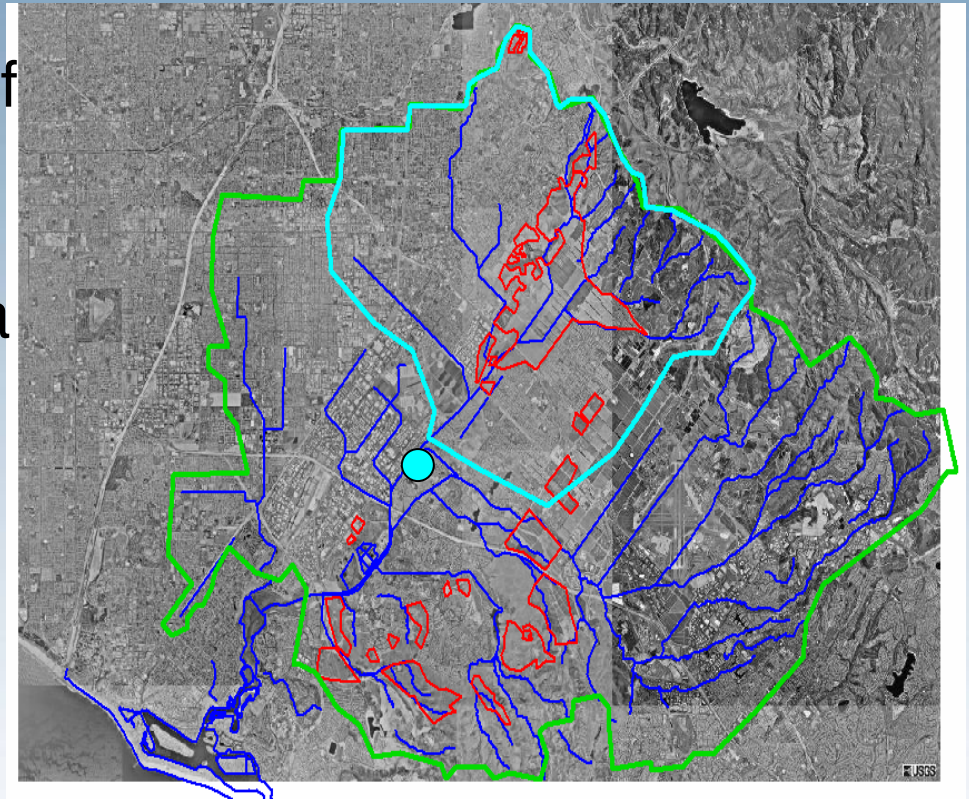
Fines conc. vs. Discharge



Coarse conc. vs. Discharge

Recent Developments in Watershed

- From 1994-2004, much of development in watershed focused in the PCW sub watershed area
- Approximately 14%



Developed areas shown outlined in red
● PCW at Barranca Pkwy Station

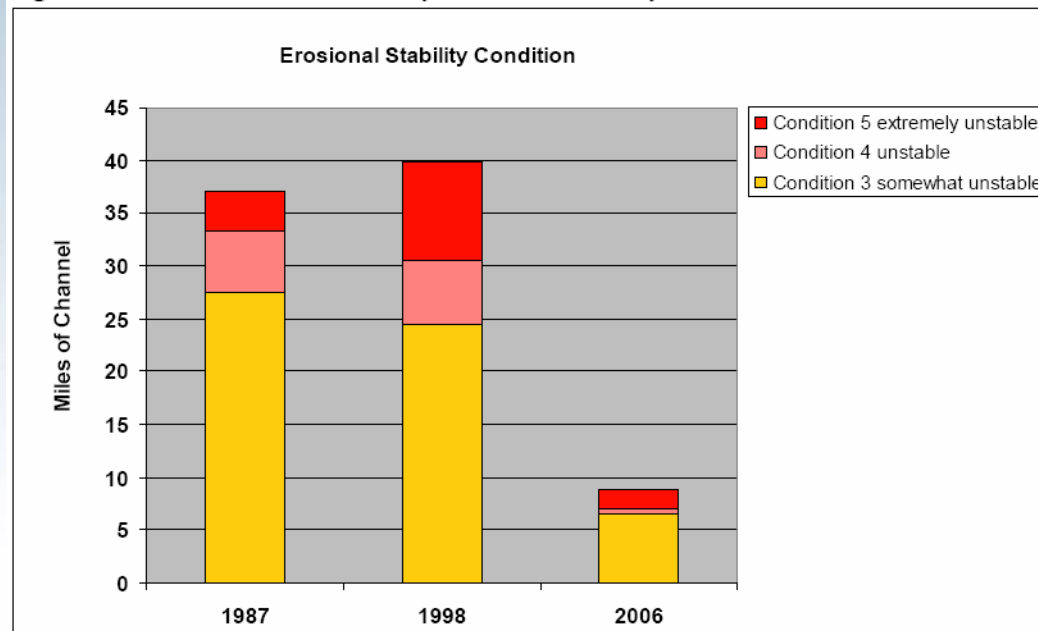
Channel Erosion Studies in Watershed

Dr. Stanley W. Trimble, UCLA



Total Miles of Channel by Condition

	Condition 3 somewhat unstable	Condition 4 unstable	Condition 5 extremely unstable
1987	27.6	5.7	3.8
1998	24.5	6.0	9.3
2006	6.5	0.5	1.8



Channel example



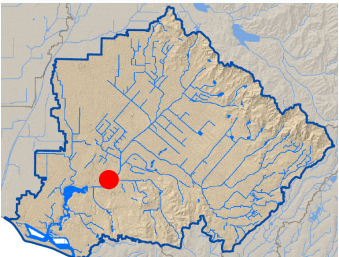
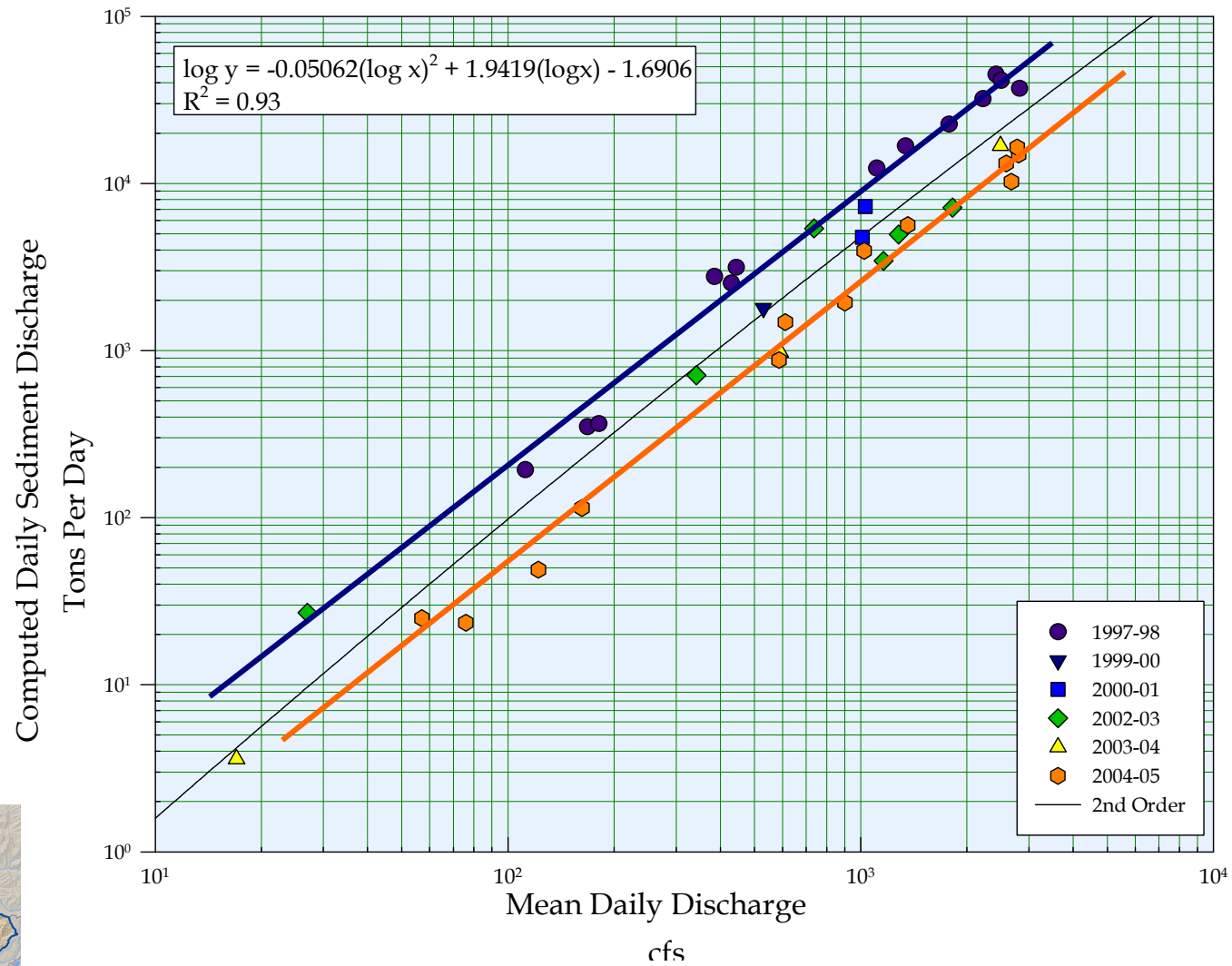
Peters Canyon Wash at Bryan Ave, 1974 vs 2008



Channel improvements ~1990's

Sediment Transport Curve, '98 - '05

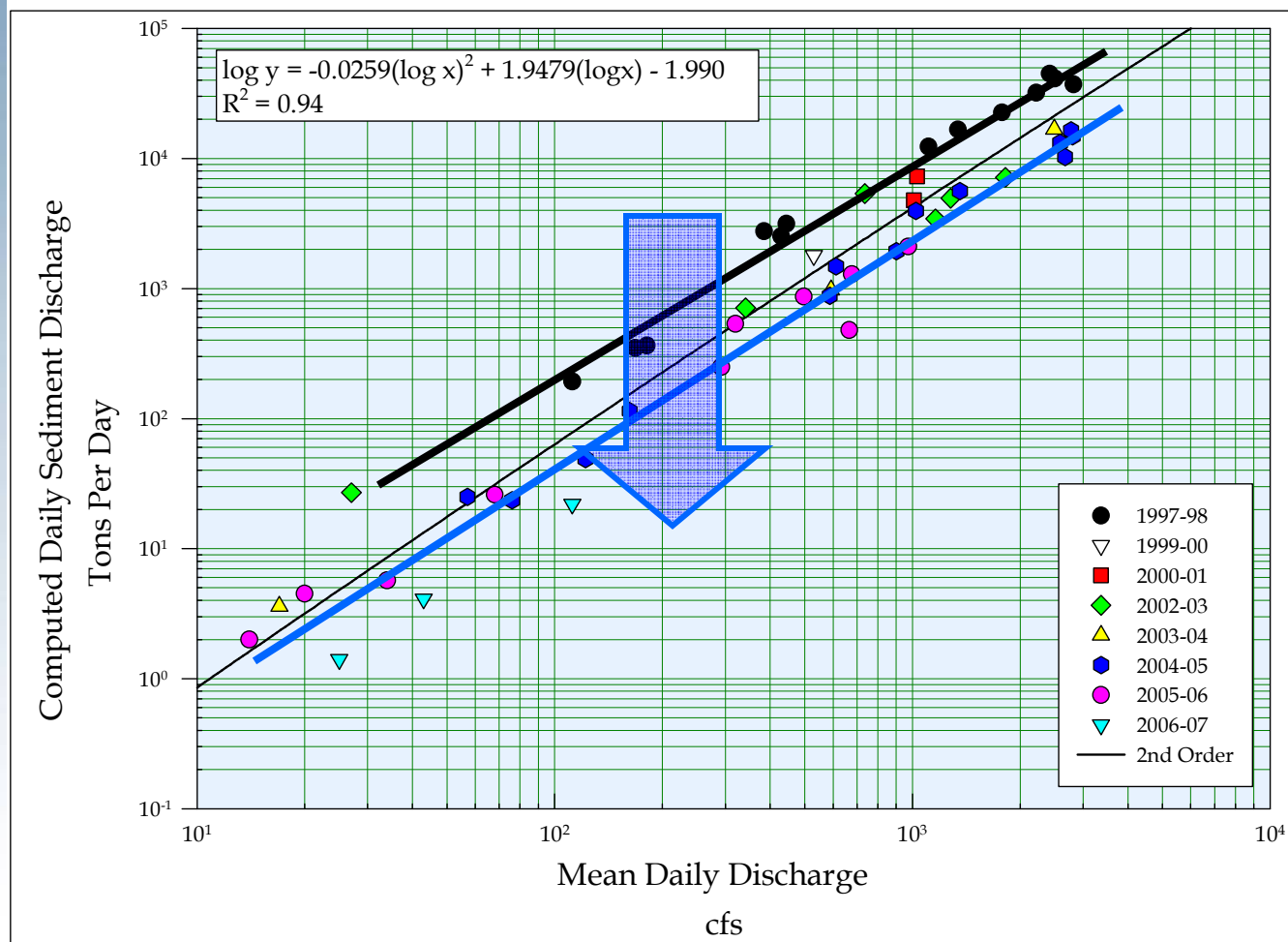
SDC at Campus Dr.



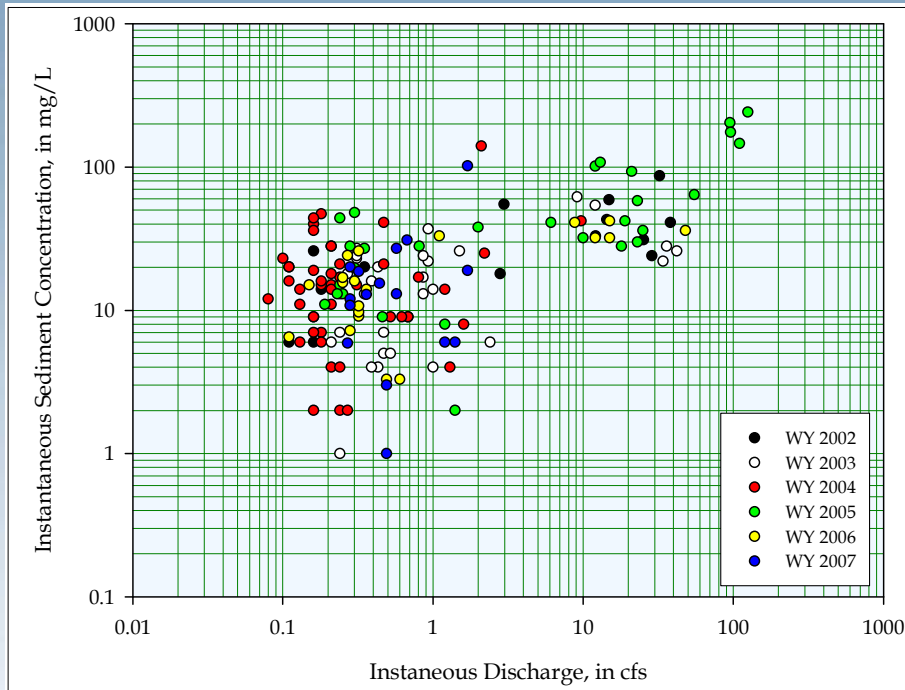
Sediment Transport Curve, 1997

2007

SDC at Campus Dr.

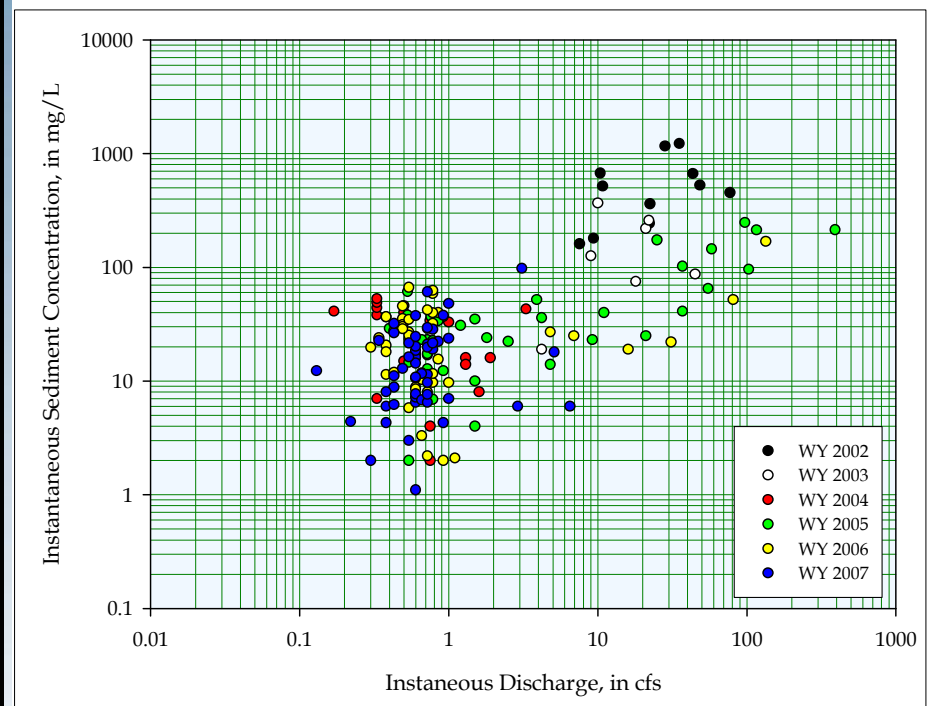


Inst. Sediment Transport Curves on recent stations



Sand Cyn Channel at University Dr

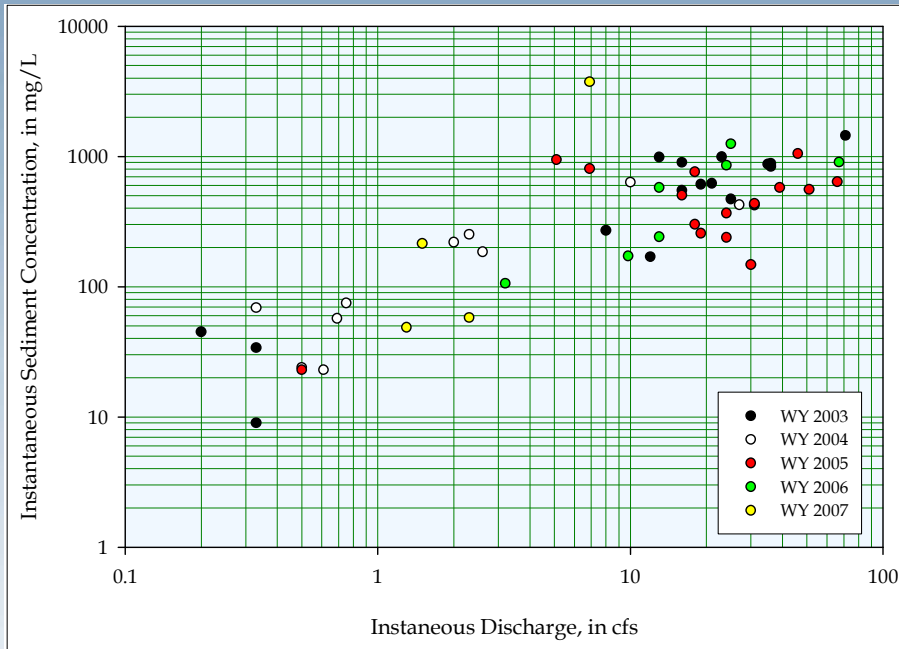
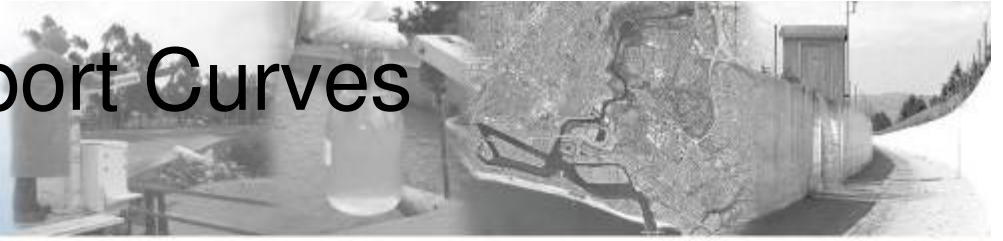
Site rep: Open Space



Bonita Creek at Mac Arthur Blvd

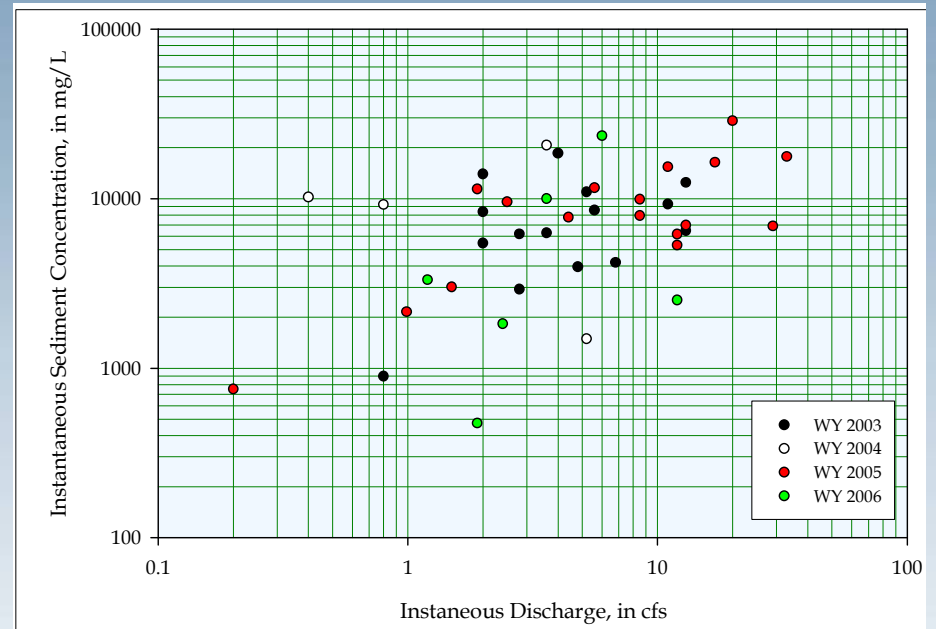
Site rep: Construction

Inst. Sediment Transport Curves on recent stations



Marshburn Channel at Trabuco Rd

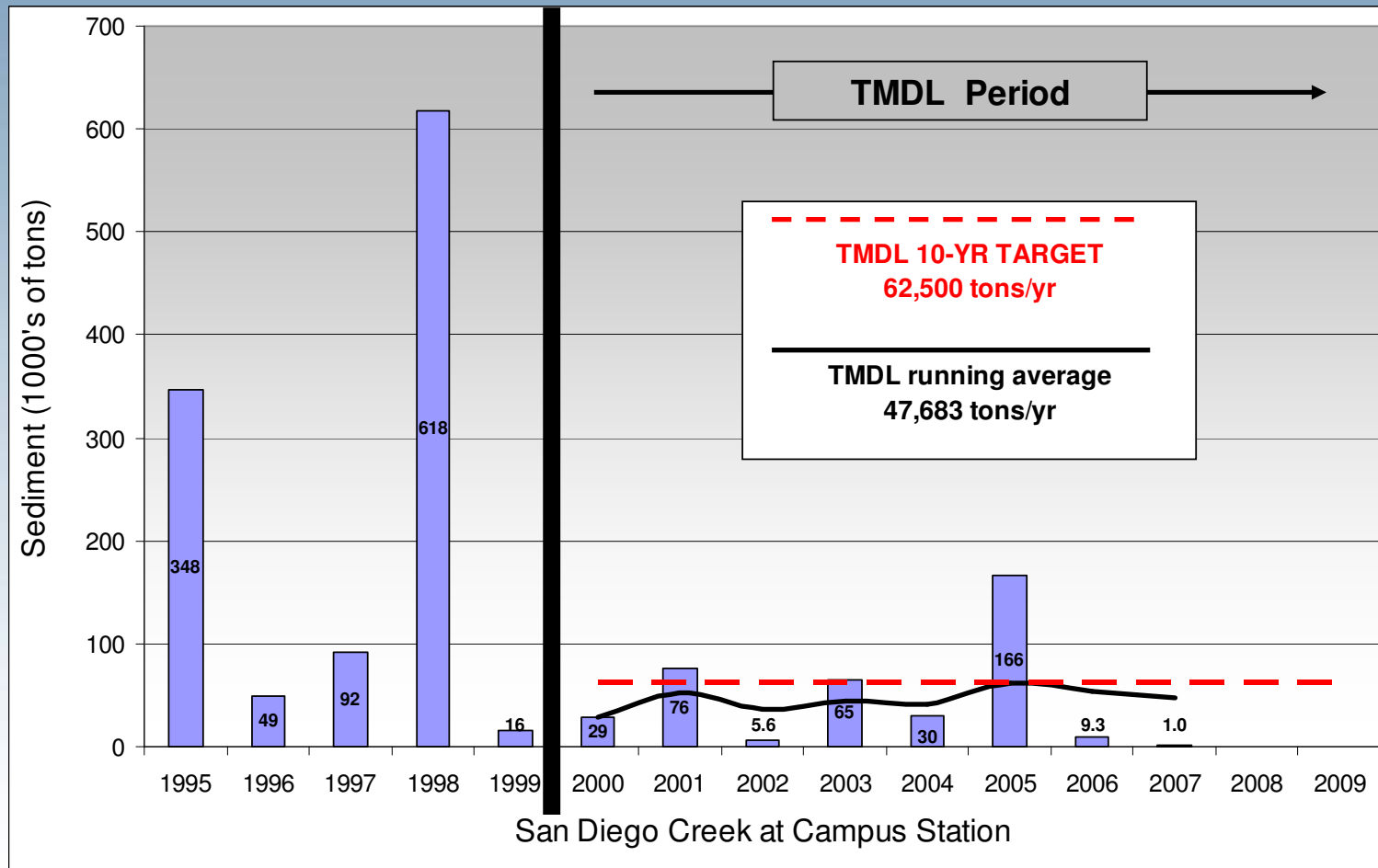
Site rep: Agriculture



Agua Chinon Wash at Irvine Blvd

Site rep: Open Space

Sediment Discharge, 1995-2007 San Diego Creek at Campus Dr.



Sediment Program - 25 yrs later



- Monitoring shows reduction in sediment discharge to Newport Bay
- Monitoring shows there is an overall dramatic reduction in length of erosionally unstable channels
- Channel improvements continuing to be made
- Cooperative efforts beginning to be realized
- Monitoring has led to a stronger focus on areas that continue to be problematic

QUESTIONS??



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